Dual purpose rotary huller[27]

STATE AWARD

A.N. Manoharan (49) who hails from Madurai, Tamil Nadu symbolizes the spirit of creativity. He studied up to the tenth standard and joined the Indian Navy when he was 16 years old. He worked in the Navy for 10 years. During his service he opted for the submarine branch. He also participated in the 1971 Indo - Pakistan war and won three medals. Due to an accident he could not continue in service and therefore retired voluntarily. He worked for two years in Port Trust, Pondichery as a Morse Signaler. He is married and has a son and two daughters.

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Scouted by
SEVA

Genesis Hulling is an essential element of food processing especially in rural India. This is currently carried out manually as the available mechanical hullers are very expensive and well beyond the reach of the common people. Thus travelling miles to process food grains is a common sight in Indian villages. Manoharan, who hails from a rural background, felt the need for a hulling machine that was affordable and easy to operate and maintain.

One of Manoharan's friends, a practitioner of herbal medicine, came to him with a request to design a machine that would help him grind small quantities of different materials simultaneously without losing their medicinal properties. This motivated him to conceptualise the design and he began working on the machine at a lathe workshop near his home. He decided to use the concepts of gravitational force and kinetic energy. With his family supporting his efforts, he developed the first prototype in 1999.

The innovation

The rotary huller developed by Manoharan is an ingenious system that can be used to hull small quantities of different items simultaneously. This machine uses the principle of the inherent gravitational force of falling bodies to do the hulling, without using any electricity or fuel.

This mechanical huller consists of a circular disc, six hollow tubes with plungers, a center shaft with chain wheel arrangement, a drive shaft with pulley arrangement, a support frame and if required an electric motor (single phase ¼ HP). The six hollow cylinders with inset plungers are fixed in a triangular shape on each side of the circular disc. The hollow tubes are constructed in such a way that one end is blocked and the other end is closed or opened with a lid that can be screwed on. These are used to load and unload the various raw materials before and after the hulling operation respectively. The center shaft passes through the axis of the disc, with a chain wheel arrangement at one end of the shaft. The drive shaft is fixed to the side of the frame. The belt drive is used to transmit the power from the electric motor to the drive shaft. The chain drive is used to transmit the power from the drive shaft to the center shaft. A chain wheel arrangement is used because chains can absorb minor shocks and vibrations due

to the hulling operation. The frame is used to support the various components in the right position and all the rotational components are supported with the help of bearing blocks. The base of the frame is horizontally fixed to the floor by laying a machine foundation.

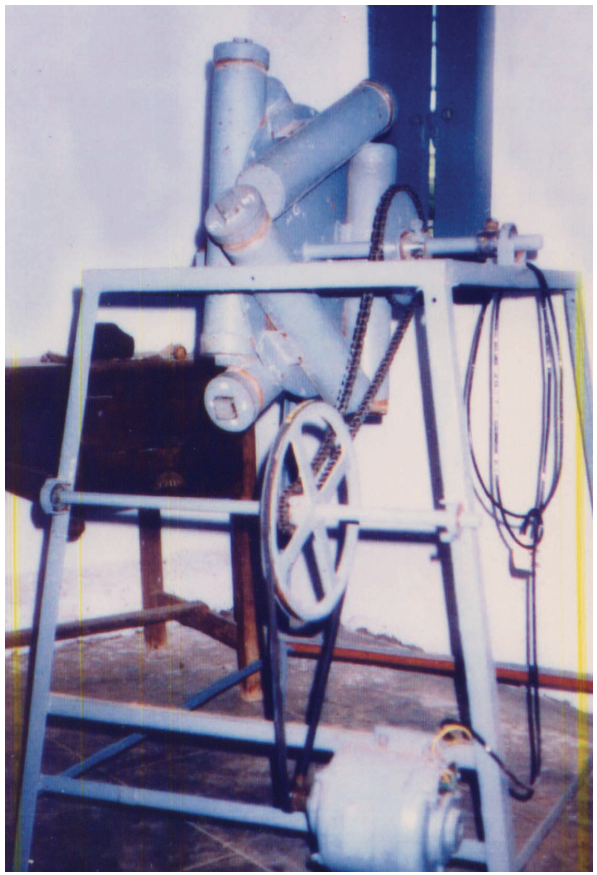
When the circular disc is rotated by hand or by an electric motor, the plungers pulverize the material inside the hollow tube. This strikes the ends of the hollow cylinder twice on one complete 360-degree rotation. On the first cycle of rotation from 0-180 degrees, when the hollow cylinder reaches a 90-degree position with respect to the center shaft, it strikes one end of the hollow cylinder due to the gravitational pull. On the second cycle of rotation from 180-360 degrees, it strikes the other end of the hollow cylinder. The momentum developed by the plunger during its travel raises the impact force. This impact force is used to pulverize the loaded material. Since the free falling plunger works on the earth's gravitational pull the speed of rotation is kept at a pace that does not overshoot the gravitational pull over the plunger.

Advantages

The machine can be operated manually as well as electrically. Since the hollow tubes are individual and discontinuous, six different varieties of items such as spices, cereals, rice and other grains may be hulled simultaneously. But in other grinding machines and mechanical hullers only one product can be ground at a time. In Manoharan's rotary huller, the hulling operation does not produce much heat so the original flavor of the product is maintained. Whereas, in the conventional grinding machines, due to high friction, a significant degree of heat is generated, which spoils the natural flavor and the chemical composition in the case of medicinal plants and roots. Manoharan's machine is easy to operate and requires very little maintenance. It has a number of applications such as, grinding herbal and non-herbal products for medicines, grinding animal waste to produce fertilizers, producing animal fodder and mixing and grinding all types of grocery items. At Rs.5000, this device costs one third of the cost of the nearest comparable mechanical huller available in the market. The output is about 3kg/hour for hard grains and 18 kg/hour for cereals. This energy efficient device is a good tool to increase mechanization in rural areas. Since it is easy to operate, women can take over the job of hulling, and eliminate the drudgery of manual hulling. The rotary huller also caters to the expectations of the consumer segment that believes in the superior quality of a product that is pounded by hand.

Current status

Manoharan has recently sold two models based on the original design and is now working on developing models of different capacities. He has also introduced a few



changes to the existing rotary huller. The machine is now able to process and discharge the materials continuously through a central feed system. Manoharan has received an order from a flour manufacturer to manufacture a 300kg/hr huller to produce flour for commercial marketing. He is now developing a multiple-compartment hexagon design rotary huller to suit this purpose. NIF has sanctioned Manoharan a sum of Rs. 26,875 from the Micro Venture Innovation Fund for prototype development of the Rotary huller to conduct a market survey. NIF has also filed a patent application (434/CHE/2004 11/05/2004) for the Rotary Huller.

Other innovations by Manoharan

Improved LPG Gas Conversion kit for automobiles

Manoharan has developed a new, safe, simple and inexpensive LPG conversion kit for automobiles. He has tested this on his Maruti Omni and found that not many changes were needed in the vehicle to incorporate this device. This kit provides multistage, pressurized fuel flow and a rich and lean fuel-air mixture to the carburetor. The resultant improved fuel efficiency and combustion provide better mileage (370-400 km) with a single LPG cylinder of 12.4 kg compared to the earlier average mileage of 220-250 kms. This environment friendly kit has great potential since many cities are now switching to LPG powered vehicles. NIF has filed for a patent (433/CHE/2004 11/05/2004) for this device.

Cell phone charger

Manoharan has also developed a charger for cell phones that uses the dynamo/ battery of the two-wheeler while the vehicle is running. It works with both AC and DC sources. In addition, the combination of IC 7805 and Zener diode at the output provides safety to the mobile phones and battery. Considering that there are more than two million cell-phone users in India who use a two-wheeler, the business prospects for such a device are promising. Some units have been sold and work is underway to develop the product further. Sustainable-agricultural and Environmental Voluntary Action (SEVA), Madurai has tried to make this device through women's self help groups, to generate local employment. NIF has filed a patent application(431/MAS/2003 26-05-2003) for this device.

Innovative solutions for industries

Manoharan has also been providing innovative solutions to various industries on commercial terms.

M/S S.A. Safiullah and Co., Pudukkottai, Tamil Nadu

One such case is that of M/S S.A. Safiullah and Co., Pudukkottai, Tamil Nadu. This company is a leading manufacturer of supari which is packed in satchets of five grams and sold in very large quantities. In the process, the company incurs about 200kg of cutting waste of the form fill satchet pocket edges. This waste which is laminated paper cannot be recycled, and it does not generate any revenue either. The company was not successful at finding a solution after repeated attempts. They then contacted Manoharan to come up with a device that would separate the PVC film from the paper. Manoharan developed a process that involves soaking the waste in an acidic solution for 45 minutes and then agitating the waste in a fresh water-bath for ten minutes where the paper gets separated from the PVC film as pulp. This pulp can be recovered using a filter of 80 mesh count. The recovery ratio is 100% for PVC film and 70% to 80% for paper. After separation, both the PVC film and the paper can be recycled and a kilo of retrieved film fetches a price of Rs12 and a kilo of white paper pulp fetches Rs.3.

The proprietor, Mr. Safiullah was very pleased with the results and entrusted him with a number of other technical problems his company was facing regarding waste management. Some of the projects on which Manoharan is currently working for the company are retrieval of aluminium foil from cutting waste of aluminium coated paper plates and manufacturing a counting machine for counting and packing of supari packets.

Sago Serve at Salem, Tamil Nadu

Manoharan has also interacted with another firm, Sago Serve at Salem, Tamil Nadu, to mechanize some of their processes. Sago Serve is a co-operative society where tapioca roots are processed into various edible and industrial products and sold internationally. But peeling the skin from the tapioca roots is a major problem faced by the industry today. Since the roots vary in size and shapes, the job is done manually and is time consuming and expensive. Due to heavy competition in marketing their products, some of the members from the society use chemicals to remove the skin from the roots. However, the residues of chemicals can remain in the by-products and prove harmful to health.

To solve this problem, Sago Serve contacted Manoharan to manufacture a device that could peel off the skin automatically. Manoharan accepted the challenge and requested the society for funds for research and development. This was approved by the governing council of the society. However, since the society's rules prevent payment to individuals for R&D work, they contacted Manoharan and asked him to work with an engineering institution. He has responded to this suggestion by requesting the society to provide the funds to a cell established by NIF at Thyagaraja College of Engineering in Madurai to enable him to do the R&D. He has since received verbal approval for this project. Manoharan is currently employed by Aarwin Technologies, Madurai for the identification and innovation of eco-friendly waste management methods. As part of his job, he has been asked to proceed to Sweden for one month for training in waste rubber disposal management at a Swedish firm manufacturing rubber crump making machine.

Mentoring

Manoharan was approached by Jayaseelan, an award winner of the second annual national competition of NIF in 2002, to make his coconut de-husking machine technically superior and energy efficient. Manoharan noted that the innovation needed significant design changes. He designed a completely new machine and fabricated it within three days. Manoharan revamped the entire drive mechanism. Unlike the old model developed by Jayaseelan, this new model works on a reduced low rpm high torque mode machine which facilitates uniform peeling speed without stopping the motor. Manoharan also introduced single feeding of coconuts from the top of the machine which makes the husking job easy, compared to the old model that needed the worker to bend to pick up coconuts for processing. Manoharan also redesigned the husk peeling knife.The knife designed by Jayaseelan had technical flaws due to which the coconut could be inserted into the machine only when the machine was stopped. But with the new knife, the inserting blade is placed in the centre of the rotating rod and this enables insertion of the coconut without stopping the spindle rod. This ensures constant speed of processing thus improving the out put of the machine.